

REMARKS

Claims 1, 2 and 5 has been amended. Claims 4 and 6 have been canceled. New claims 7-12 have been added. Thus, claims 1-3, 5 and 7-12 are presented for examination. Support for the amendment to claim 1 may found in the specification at pages 23-24, paragraph [0055]; page 25, paragraph [0058]; page 39, paragraph [0091]; and page 42, paragraph [0100]. Support for new claim 8 may be found at page 12, paragraph [0024]. Support for new claim 9 may be found at pages 23-24, paragraph [0055]; page 25, paragraph [0059]; page 30, paragraph [0070]; and page 35, paragraph [0082]. Support for new claim 10 may be found at page 36, paragraph [0084]. Support for new claim 11 may be found at page 42, paragraph [0100]. Support for new claim 12 may be found in original claim 6. Thus, no new matter has been added. Reconsideration and withdrawal of the present rejections in view of the amendments and the comments presented herein are respectfully requested.

Claim objection

The Examiner objected to claim 2, stating that the bracket before "film thickness", before "wherein" and after "seconds" should be deleted. Appropriate correction has been made.

Rejection under 35 U.S.C. §103(a)

Claims 1-5 were rejected under 35 U.S.C. §103(a) as being unpatentable over Szmanda et al. (US 6,787,286). The Examiner alleges that based on the teachings of the reference, it would have been obvious to one of ordinary skill in the art to prepare the material of Szmanda et al. choosing to employ PGME or MAK as the resist solvent.

Claim 1 as amended recites both (1) and (2) below:

(1) an organic solvent which comprises one or more compounds selected from the group consisting of propylene glycol monomethyl ether (PGME), methyl amyl ketone (MAK), butyl acetate (BuOAc) and 3-methyl methoxy propionate (MMP).

(2) a compound (A) which comprises:

a resin component (A-1) which undergoes an increase in alkali solubility under the action of acid; or

a low molecular weight compound (A-2) with a molecular weight of no more than 2,000,

wherein the resin component (A-1) comprises a unit selected from the group consisting of:

(i) a structural unit (a1) represented by a general formula (I) within a range from 40 to 80 mol%; and

(ii) a structural unit which contains a lactone-containing monocyclic or polycyclic group, and is derived from a (meth)acrylate ester.

The invention of Szmanda et al. relates to photoresist compositions that comprise a fluorine-containing polymer, a photoactive component, particularly a photoacid generator compound, and a solvent (see column 4, lines 20-23). Examples of the solvent include MAK and PGME. However, Szmanda et al. fails to teach or suggest the presence of the recited compound (A).

In processes using electron beams or EUV, a problem arises in that as exposure is continued, the exposure radiation reaching the substrate weakens, and stable exposure, or exposure itself, becomes impossible (see specification at paragraph [0013]). The present invention resolves this problem. As described in the specification at paragraph [0014], as repeated exposure is conducted, the mirror and mask become contaminated. The resist composition of claim 1 comprising features (1) and (2) above effectively prevents contamination in lithography processes using an electron beam or EUV. As a result, by using the configuration of claim 1, the problem described above can be unexpectedly improved.

The resin compound (A-1) and the low molecular weight compound (A-2), both of which are the components of the compound (A) in amended claim 1 of the present invention, are neither disclosed nor suggested by Szmanda et al. Therefore, the present invention, in which the compound (A) comprises the groups described in claim 1, is different from Szmanda et al., in which the resist composition comprises a fluorine-containing polymer.

Further, Szmanda et al. discloses in column 14, lines 10-12 that "the fluorine-containing polymer of a resist of the invention suitably does not contain aromatic units such as phenyl, naphthyl, or pyridyl." Also, Szmanda et al. discloses in column 14, lines 13-16 that "a fluorine-

containing polymer may be present with one or more other resins in a resist composition. Those additional resin(s) may or may not contain a fluorine and typically do not contain aromatic units." That is, the resin in the invention of Szmanda et al. preferably does not have aromatic units, as in the presently recited structural unit (a1).

On the other hand, the structural unit (a1) of the present invention contains phenyl groups, and the quantity of the structural unit (a1), which has a phenyl group shown in the general formula (I), in the resin is within a range from 40 to 80 mol%. The unexpected beneficial effect caused by having phenyl groups (a1) in an amount of at least 40 mol% is disclosed in the specification at paragraph [0058] as follows:

"By ensuring that this quantity is at least 40 mol%, the solubility of the resin in the alkali developing solution can be improved, and a favorable improvement in the resist pattern shape can also be obtained."

As described above, Szmanda et al. clearly discloses that the invention preferably does not have a phenyl group, which is a component recited in present claim 1, and thus the claimed invention and that of Szmanda et al. are clearly distinct (especially in the compound (A) and the quantity of aromatic units). The beneficial effects described above could not have been predicted based on Szmanda et al.

Thus, even if PGME or MAK are chosen from various examples of solvents in Szmanda et al., this would not lead one of ordinary skill in the art to arrive at the present invention. In addition, the invention of Szmanda et al., which differs from claim 1 in the compound (A), cannot obtain another beneficial effect of the present invention, described in paragraph [0018] as follows:

"By application of the present invention, contamination within the exposure apparatus can be prevented for processes that use an electron beam or EUV."

Thus, claim 1 is clearly nonobvious over the cited reference. Because claim 1 is nonobvious, then dependent claims 2, 3-5 and 7-11 are necessarily nonobvious, as is claim 12 which depends on any one of claims 1-3, 5 and 7-11.

Claim 6 was rejected under 35 U.S.C. §103(a) as being unpatentable over Szmanda et al. (US 6,787,286) in view of Irie (US 6,855,485 pr 6,966,710). Claim 6 has been canceled herein,

and rewritten as new claim 12, which is multiply dependent on claims 1-3, 5 and 7-11. As discussed above, claims 1-3, 5 and 7-11 are nonobvious over Szmanda et al. Irie neither discloses nor suggests the resin components and the organic solvents recited in these claims. Thus, the addition of Irie does not cure the defects in the teaching of Szmanda et al.

In view of the amendments and comments presented above, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. 103(a).

CONCLUSION

Applicants submit that all claims are in condition for allowance. However, if minor matters remain, the Examiner is invited to contact the undersigned at the telephone number provided below.

Respectfully submitted,

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Dated: September 20, 2007

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